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ORIGINAL ARTICLE

Three new species of *imitator*-group of the genus *Macrophya* (Hymenoptera, Tenthredinidae) from China

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Abstract Three species, *Macrophya circulotibialis* Li, Liu & Heng, **sp. nov.**, *M. curvatitheca* Li, Liu & Heng, **sp. nov.** and *M. changbaina* Li, Liu & Heng, **sp. nov.**, of the *imitator*-group of the genus *Macrophya* Dahlbom (Hymenoptera, Tenthredinidae) from China are described as new to science. A key to all known species of the *imitator*-group from China is provided. The specimens examined in this study, including all holotypes and paratypes of the new species, are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, Hunan, China, and the Department of Zoology, National Museum of Nature and Science, Amakubo, Tsukuba, Ibaraki, Japan.

Key words Symphyta, Tenthredinidae, *Macrophya*, taxonomy.

1 Introduction

Macrophya Dahlbom, 1835, which is the third largest genus in Tenthredininae and the fourth largest of Tenthredinidae, contains 266 species worldwide (Li & Wei, 2013; Li *et al*., 2013a, b, c, 2014a, b, 2015a; Shinohara & Li, 2015). In China, there are 128 species recorded in *Macrophya* (Wei *et al.*, 2006, 2013; Taeger *et al.*, 2010; Zhao *et al.*, 2010; Zhao & Wei, 2011; Zhu *et al.*, 2012; Li *et al.*, 2012, 2013a, b, c, 2014a, b, 2015a; Li & Wei, 2012, 2013; Wu *et al.*, 2012).

Macrophya includes 27 groups worldwide (Li *et al.*, 2014a). It can be diagnosed by following: body mainly black, with white, yellow, reddish brown and others maculae more or less; antennae usually short filamentous, without lateral carina; lateral sides of eyes distinctly convergent forwards; anal cell in fore wing usually with a short petiole, if not, fore wing with a short and erect cross-vein; valviceps of pennis valve usually with an ergot. It is easy to be distinguished with other relatives genus in Macrophini.

In China, 20 species groups of *Macrophya* are present (Li *et al.*, 2014b). *Imitator*-group is the second largest group in *Macrophya*, with 12 species all over the the world, which are all present in China, namely, *M. bui* Wei & Li, 2012, *M. curvatisaeta* Wei & Li, 2010, *M. flactoserrula* Chen & Wei, 2002, *M. funiushana* Wei, 1998, *M. imitatoides* Wei, 2007, *M. imitator* Takeuchi, 1937, *M. jiaozhaoae* Wei & Zhao, 2010, *M. kangdingensis* Wei & Li, 2012, *M. nigromaculata* Wei & Li, 2010, *M. parimitator* Wei, 1998, *M. postscutellaris* Malaise, 1945 and *M. weni* Wei, 1998 (Chen & Wei, 2002; Li & Wei, 2012; Wei, 1998, 2007; Zhao *et al.*, 2010). Among them, *M. imitator* Takeuchi is also distributed in Japan, Korea and East

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Siberia (Takeuchi, 1937), and *M. postscutellaris* Malaise is also distributed in Burma (Malaise, 1945). All these species share similar general morphology and form the distinct species group, *imitator*-group.

In this paper, three new species of *imitator*-group from China are described, namely *Macrophya circulotibialis* Li, Liu & Heng, **sp. nov.**, *M. curvatitheca* Li, Liu & Heng, **sp. nov.** and *M. changbaina* Li, Liu & Heng, **sp. nov.**, and a key to all known species from China is provided.

2 Materials and methods

The specimens were examined with a Motic-SMZ-168 steteomicroscope. Adult images were taken with a Nikon D700 digital camera and a series of images montaged using Helicon Focus (©HeliconSoft). All images were further processed with Adobe Photoshop CS 11.0.

Morphological descriptions of new species are based on the holotype. The terminology of genitalia follows Ross (1945) and that of general morphology follows Viitasaari (2002). For a few terms (e.g. middle fovea and lateral fovea), we follow Takeuchi (1952).

The specimens examined in this study, including all holotypes and part paratypes of the new species, are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, Hunan, China (CSCS). Whereas, other paratypes are deposited in the Department of Zoology, National Museum of Nature and Science, Amakubo, Tsukuba, Ibaraki, Japan (NMS).

3 Taxonomy

The *imitator*-group

Diagnosis. Body mainly black, without metallic tinge; antenna slender, black; posterior margin of metepimeron straight or slightly concave, appendage (posterior corner of metepimeron) differentiated but not elongated, at least partly punctured and evenly pilose, without basin; abdominal tergum 1 not reticulate; penis valve oval, narrowed towards apex, ergot short.

Species of the *imitator*-group could be easily recognized from other species of *Macrophya* by a combination of the following characters: antenna, mesoscutellum, hind tarsus, abdominal terga 2 to 10 and outer side of hind coxa always entirely black; head dorsally densely punctured; anal cell of fore wing constricted, without cross vein; hind anal cell petiolate; metepimeron appendage at least partly punctured and pilose; serrulae slightly oblique, almost flat or weakly protruding.

Key to species of the *imitator*-group of *Macrophya* from China.

1. Female: ovipositor sheath much longer than middle tibia; male: hairs on abdominal terga erect, about as long as diameter of middle ocellus ..... ***M. weni* Wei, 1998**
   Female: ovipositor sheath clearly shorter than middle tibia; male: if hairs on abdominal terga erect, then much shorter than diameter of middle ocellus 2
2. Apex of middle tibia with a distinct white macula on dorsal side; punctures on middle part of mesepisternum minute, much smaller than punctures on dorsal side of head 3
   Apex of middle tibia without white macula on dorsal side, but sometimes with a white spot or stripe on anterior side; punctures on middle part of mesepisternum about as large as or slightly smaller than punctures on dorsal side of head 9
3. Hind trochanter entirely yellowish white 4
   Hind trochanter more or less with a distinct black macula 5
4. Ovipositor sheath longer than fore tibia, with lateral setae very short, not distinctly curved; middle serrulae with 20 fine distal teeth; clypeus and abdominal sternites in male largely yellowish white ..... ***M. flactoserrula* Wei and Chen, 2002**
   Ovipositor sheath shorter than fore tibia, with lateral setae long and curved; middle serrulae with 10 to 12 distal teeth; male unknown ..... ***M. funiushana* Wei, 1998**
5. Pronotum entirely black 6
   Posterior margin of pronotum white 7

6. Postocellar area 1.7 times broader than long; hind trochanters in both sex almost entirely black; hind trochanter entirely black; the white stripe on the subapical part of hind tibia about 2/5 length of hind tibia; the inner side of metepimeron appendage with a distinct shiny and obtuse carina; ovipositor sheath as long as fore tibia; the middle serrulae with 13 to 16 distal teeth ..... ***M. bui* Wei & Li, 2012**
   Postocellar area 2.0 times broader than long; hind trochanters in both sex largely black; hind trochanter largely white, ventral side with black maculae; the white stripe on the subapical part of hind tibia shorter than 1/3 length of hind tibia; the inner side of metepimeron appendage without a shiny and obtuse carina; ovipositor sheath distinctly longer than fore tibia; the female serrular oblique and weakly protruding, with several larger teeth, the middle serrulae with 5 to 7 distal teeth ..... ***M. parimitator* Wei, 1998**
7. A broad ring of hind tibia at center as long as 1/2 length of hind tibia (Figs 1–2) ..... ***M. circulotibialis* Li, Liu & Heng, sp. nov.**
   A white macula of hind tibia subapically shorter than 1/2 length of hind tibia 8
8. Abdominal tergum 1 entirely black, posterior margin without white macula (Fig. 27); middle serrulae each with 1 to 2 proximal and 14 to 15 distal teeth, subbasal teeth small (Fig. 34)..... ***M. changbaina* Li, Liu & Heng, sp. nov.**
   Posterior margin of abdominal tergum 1 with 2 small, distinct and white maculae (Figs 14–15); middle serrulae flat, middle serrulae each with 2 proximal and 15 to 18 distal teeth, subbasal teeth minute ..... ***M. curvatitheca* Li, Liu & Heng, sp. nov.**
9. Punctures on head and mesepisternum clearly defined, equal in size, interspaces strongly shiny; punctures on metepimeron appendage clearly separated; a white macula of hind tibia as long as 1/2 length of hind tibia..... ***M. postscutellaris* Malaise, 1945**
   Punctures on mesepisternum smaller than punctures on head, both very close to each other, interspaces very fine, partly obscure, less shiny; punctures on metepimeron appendage hardly separated; a white macula subapically of hind tibia distinctly shorter than 1/2 length of hind tibia 10
10. Frons distinctly convex and above top of eyes; posterior 1/3 of abdominal tergum 1 with white bands and run through the breadth of abdominal tergum 1 ..... ***M. kangdinensis* Wei & Li, 2012**
    Frons flat and not above top of eyes; posterior margin of abdominal tergum 1 with very narrow, white band, or with 2 transverse, white maculae 11
11. Posterior margin of pronotum white..... 12
    Pronotum entirely black 13
12. Setae on sheath short and straight in dorsal view; inner side of metepimeron appendage without glabrous patch; middle serrulae with 9 to 10 fine distal teeth; annular spine bands narrow and remote to each other ..... ***M. imitatoides* Wei & Chen, 2007**
    Setae on sheath long and evenly curved in dorsal view; inner side of metepimeron appendage with a distinct glabrous patch; middle serrulae with 5 to 6 fine distal teeth; annular spine bands broadly meeting to each other at middle ..... ***M. curvatisaeta* Wei & Li, 2011**
13. Postocellar area 1.7 times as broad as long, with obscure posterior carina; hind trochanter yellowish white ..... ***M. imitator* Takeuchi, 1937**
    Postocellar area more than 2 times as broad as long, with distinct posterior carina 14
14. Hind trochanter with a large black macula in female and entirely black in male; ventral side of hind femur in male black; eyes smaller, middle breadth of postorbit slightly more than half (in female) or 1/3 (in male) breadth of eye in lateral view; height of eye in frontal view about 1.3 times (in both sexes) distance between lower corner of eyes; middle serrulae with 7 to 9 distal fine teeth ... ***M. nigromaculata* Wei & Li, 2010**
    Hind trochanter yellowish white in both sexes; ventral side of hind femur in male usually white; eyes larger, middle breadth of postorbit distinctly less than half (in female) or about 1/3 (in male) breadth of eye in lateral view; height of eye in frontal view about 1.6 times (female) or 1.4 times (male) distance between lower corner of eyes; middle serrulae with 5 to 7 distal fine teeth ..... ***M. jiaozhaoae* Wei & Zhao, 2011**

4 Description

4.1 *Macrophya circulotibialis* Li, Liu & Heng, sp. nov. (Figs 1–13)

Female. Body length 6.5–7.0 mm. Body and legs black; palp largely sordid brown; a narrow and short triangular anterior margin of labrum pale brown; following parts white: basal 1/2 of mandibles, a broad band on posterior margin of pronotum, a narrow band on posterior margin of abdominal tergum 1, apical margins of all coxae, basal margins and apical margins of fore and middle trochanters, basal margins of fore and middle femora, apical 1/2 on anterior side of fore femur, anterior side and a small macula of subapex on dorsal side of fore tibia, a small macula of apex on anterior side of middle femur, anterior side largely and a ring on subapical 1/3 of middle tibia, hind trochanter except for ventral side with black stripes, basal margin of hind femur and a broad ring on middle 1/2 of hind tibia; basal margins of tarsomere of all legs pale

black brown. Body hairs silver, setae on sheath pale back brown. Wings hyaline, without smoky macula, stigma and veins largely black brown (Fig. 1).

Dorsal head less shiny, frons densely and minutely punctured, without smooth interspaces between punctures, with distinct microsculptures (Fig. 3); labrum with sparse and shallow punctures, microsculptures fine; clypeus with some large and shallow punctures, microsculptures distinct. Mesonotum less shiny, punctures on mesonotum shallower and denser than punctures on head, interspaces between punctures with fine microsculpteres; mesoscutellum less shiny, vertex with some punctures and microsculptures; posttergum with some large punctures; metascutellum less shiny, with indistinct punctures and microsculptures. Mesepisternum less shiny, densely and minutely punctured, interspaces between punctures narrow; anepimeron dull, with rugose wrinkles; anterior margin of katepimeron strongly shiny and smooth, without puncture and microsculpture, posterior area of katepimeron with some shallow and large punctures, microsculptures dense; metepisternum dull, with shallow punctures; center of metepimeron shiny, dorsal side and posterior corner with dense punctures, microsculptures distinct; mesopleuron and metapleuron as shown in Fig. 6. Abdominal tergum 1 shiny, lateral sides with some shallow punctures, center with fine microsculptures; other abdominal terga less shiny, with some indistinct punctures and fine microsculptures. Hind coxa and outer side of hind femur with some minute and shallow punctures, interspaces between punctures with fine microsculptures, less shiny. Surface of sheath coriaceous, with indistinct punctures and fine microsculptures.

Center of labrum elevated, anterior margin of labrum truncate; clypeus weakly elevated, broader than the distance between the lower corner of eyes; lateral sides distinctly convergent forwards, anterior margin shallowly incised to approximately 1/4 length of clypeus, lateral corners short and obtuse (Fig. 4); malar space 0.8 times the diameter of the middle ocellus; frons flat, ocellus as high as the top of the eyes in lateral view; middle fovea shallow, lateral foveae slightly deep, round like; interocellar furrow distinct, postocellar furrow indistinct; POL : OOL : OCL = 3.5: 8.0: 5.0; anterior area of postocellar area elevated, posterior area depressed, 2.5 times broader than long; lateral furrow deep and slightly narrow, divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, 1.1 times longer than head and thorax together, 0.8 times longer than abdomen; antennomere 2, 1.2 times as long as breadth, antennomere 3, 1.9 times as long as antennomere 4 (10: 9), as long as antennomeres 4 and 5 combined, middle antennomeres slightly inflated, subapical antennomeres 5 to 8 weakly compressed (Fig. 5). Mesoscutellum roundly elevated, without carina and peak, lower than the top of mesonotum in lateral view; posttergum with lower middle carina; metascutellum with short middle carina; dorsal-posterior platform of mesepimeron about as broad as the diameter of the middle ocellus; posterior corner of metepimeral appendage platform-like, without basin; the distance between cenchri 2 times breadth of a cenchrus; mesopleuron and metapleuron as shown in Fig. 6. Inner tibial spur of hind leg approximately 0.7 times length of hind tarsomere 1 (2: 3); hind tarsomere 1 slender, about as long as following 4 tarsomeres combined; claw with inner tooth shorter than outer tooth. Ovipositor sheath slightly shorter than hind tarsomere 1 (5: 6), apical sheath as long as basal sheath, apical margin roundish in lateral view (Fig. 7). Fore wing with crossvein cu-a joining cell 1M at basal 1/3, crossvein 2r joining cell 2Rs at apical 1/3, cell 2Rs slightly shorter than cell 1Rs, anal cell with a short petiole, about as long as crossvein 1r-m; petiole of anal cell in the hind wing about half longer than crossvein cu-a. Lancet short and narrow, with 17 serrulae (Fig. 8), middle serrulae flat, middle serrulae each with 2 to 3 proximal and 15 to 22 distal teeth, subbasal teeth very minute, annular spine bands narrow, 6^{th} to 8^{th} serrulae at basal as shown in Fig. 9.

Male. Body length 5 mm (Fig. 2); body color and structure similar to female, but labrum and clypeus largely white, base of clypeus black (Fig. 10); antenna slightly broad, antennomere 2 as long as breadth (Fig. 11); following parts white: base and outer sides of all coxae, apex largely on anterior sides of fore and middle femora, anterior side of fore tibia, base on anterior side and a broad ring on subapex of middle tibia, ventral side largely of fore tarsus, apical 2/5 of abdomianl tergum 1 and center of all sternums; subgenital palte longer than broad, center slightly elevated, apical margin roundish; inner margin on base of harpe distinctly protruding, clearly narrowed toward apex, base about 2.5 times longer than apex (Fig. 12); penis valve as shown in Fig. 13, valviceps about 2 times longer than broad.

Holotype ♀, China, Shaanxi, Xi'an City, Chang'an Region, Jiwozi (33°51′ N, 108°49′ E; elev. 1 720 m), 23 May 2008, Hai-Li Yu leg., desposited in CSCS. Paratypes: 1♀, China, Shaanxi, Qinling Mts., Mt. Taibai, Kaitianguan (34°00′ N, 107°51′ E; elev. 2 000 m), 5 June 2007, A. Shinohara leg.; 1♀, China, Shaanxi, nr. ropeway, Tangyu Town, Qinling Mts., Mt. Taibai, Kaitianguan (34°00′ N, 107°51′ E; elev. 2 700 m), 7 June 2007, A. Shinohara leg.; 1♀, China, Shaanxi, Qinling Mts., Mt. Taibai, Kaitianguan (34°00′ N, 107°51′ E; elev. 2 000 m), 28 May 2005, A. Shinohara leg.; 1♀, 1♂, China, Shaanxi, Qinling Mts., Mt. Taibai, Kaitianguan (34°00′ N, 107°51′ E; elev. 2 000 m), 7 June 2006, A. Shinohara leg. All paratypes are deposited in NMS.

Figs 1–13. *Macrophya circulotibialis* Li, Liu & Heng, **sp. nov.** 1. Female, dorsal view. 2. Male, dorsal view. 3. Female head, dorsal view. 4. Female head, anterior view. 5. Female antenna. 6. Female mesopleuron and metapleuron. 7. Ovipositor sheath, lateral view. 8. Lancet. 9. 6th–8th serrulae of lancet. 10. Male head, anterior view. 11. Male antenna. 12. Gonoforceps. 13. Penis valve. Scale bars: 1–2 = 1 mm, 9, 13 = 50 μm, 8, 12 = 100 μm.

Distribution. China (Shaanxi).

Etymology. The new specific name "*circulotibialis*" is derivid from two Latin words, the "*circus*" (circle) and "*tibialis*" (tibia), with reference to the broad white ring at center of hind tibia.

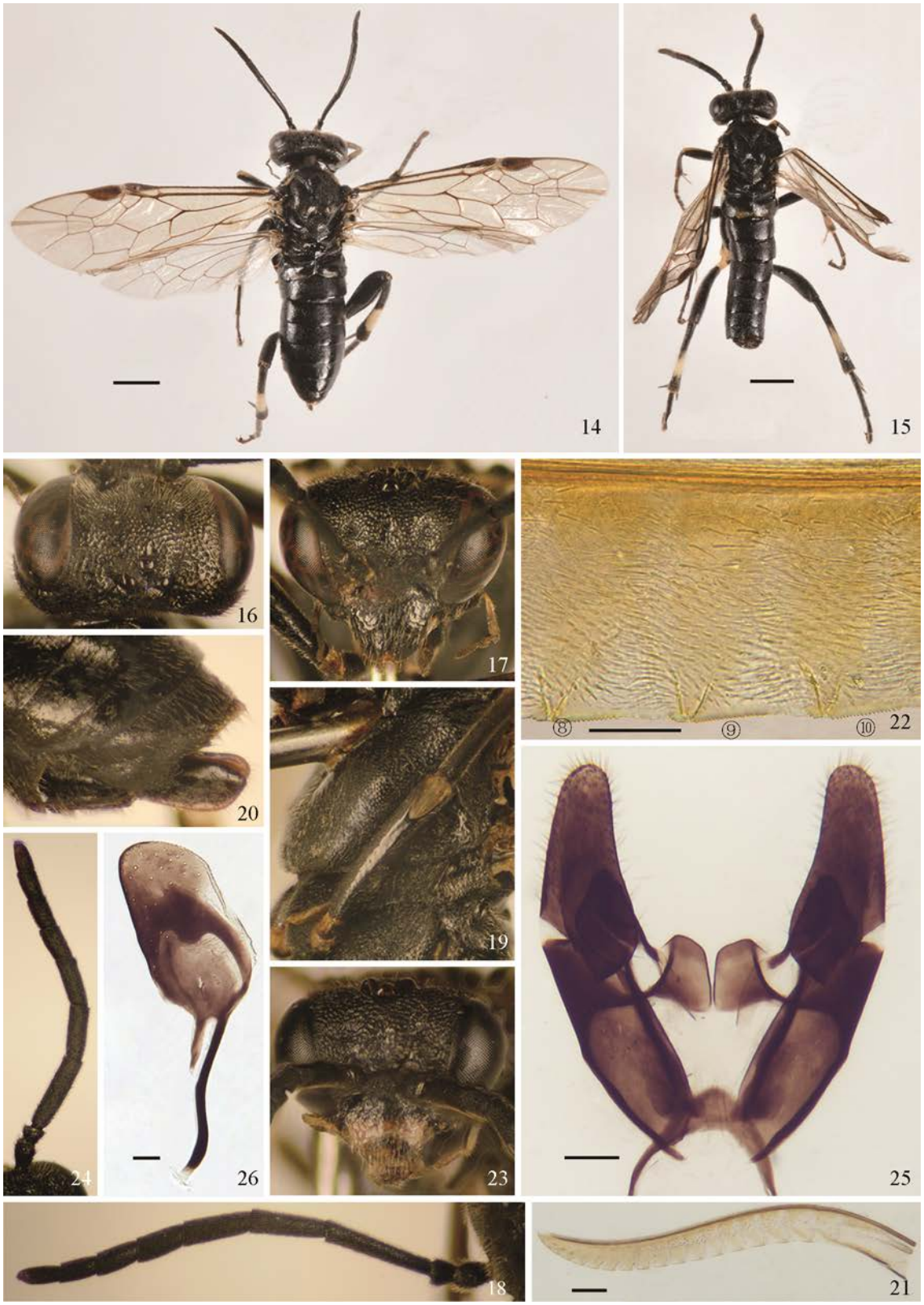
Remarks. The new species is similar to *M. funiushana* Wei, 1998, but differs from the latter by: postocellar area 2.5 times broader than long; fore and middle trochanters largely black; middle 1/2 of hind tibia with a broad white ring; ovipositor sheath slightly shorter than metabasitarsus; serrulae of lancet very flat, middle serrulae each with 2 to 3 proximal and 15 to 22 distal teeth, subbasal teeth very minute. In *M. funiushana*, postocellar area about 2 times broader than long; fore and middle trochanters almost entirely white; subapical 1/3 with a long white macula on dorsal side of hind tibia; ovipositor sheath clearly shorter than metabasitarsus; serrulae of lancet weakly protruding, middle serrulae each with 2 proximal and 8 to 11 distal teeth, subbasal teeth small.

4.2 *Macrophya curvatitheca* Li, Liu & Heng, sp. nov. (Figs 14–26)

Female. Body length 6.5 mm. Body and legs black; palp and a narrow and short triangular anterior margin of the labrum pale brown; following parts white: basal 1/2 of the mandibles, a broad band on posterior margin of the pronotum, a narrow band on posterior margin of abdominal tergum 1, apical margin of abdominal tergum 10, apical margins of all coxae, fore and middle trochanters shortly, dorsal side of hind trochanter, some stripes on apex largely on anterior side of fore femur, anterior side of fore tibia except for apex with black maculae, a small macula on apex on anterior side of middle femur, a small macula on subapex on dorsal side of middle tibia and a long macula on subapical 2/5 on dorsal side of hind tibia. Body hairs silver, setae on sheath black brown. Wings hyaline, without smoky macula, stigma and veins largely black brown (Fig. 14).

Dorsal head less shiny, frons densely and minutely punctured, without smooth interspaces between punctures, microsculptures fine (Fig. 16); labrum and clypeus less shiny, with some large and shallow punctures, microsculptures fine. Mesonotum less shiny, punctures on mesonotum shallower and denser than punctures on head, interspaces between punctures with fine microsculpteres; mesoscutellum less shiny, vertex with some large punctures and fine microsculptures; lateral sides of posttergum with some large punctures, microsculptures distinct; metascutellum less shiny, with indistinct punctures, microsculptures fine but distinct. Mesepisternum less shiny, densely and minutely punctured, interspaces between punctures narrow and with fine microsculptures; anepimeron dull, with rugose wrinkles; posterior margin of mesepisternum and anterior margin of katepimeron strongly shiny and smooth, without puncture and microsculpture, posterior area of katepimeron with some shallow and large punctures, microsculptures distinct; metepisternum dull, with minute and shallow punctures; metepimeron less shiny, dorsal side with dense punctures, microsculptures distinct; mesopleuron and metapleuron as shown in Fig. 19. Abdominal tergum 1 shiny, lateral sides with some shallow punctures, center with fine microsculptures; other abdominal terga less shiny, with some indistinct punctures and fine microsculptures. Hind coxa and outer side of hind femur with some minute and shallow punctures, interspaces between punctures with fine microsculptures, less shiny. Surface of sheath coriaceous, with indistinct punctures and fine microsculptures.

Center of labrum elevated, anterior margin of labrum truncate; clypeus weakly elevated, broader than the distance between the lower corner of eyes; lateral sides distinctly convergent forwards, anterior margin shallowly incised to approximately 1/4 length of clypeus, lateral corners short and obtuse (Fig. 17); malar space 0.5 times the diameter of the middle ocellus; frons flat, ocellus as high as the top of the eyes in lateral view; middle fovea shallow, long dot like; lateral foveae slightly deep, round dot like; interocellar furrow distinct, postocellar furrow indistinct; POL : OOL : OCL = 4: 8: 5; center of postocellar area clearly elevated, 2.5 times broader than long; lateral furrow deep and slightly narrow, divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, as long as head and thorax together, 0.9 times longer than abdomen; antennomere 2, 1.2 times as long as breadth, antennomere 3, 1.5 times as long as antennomere 4 (3: 2), 0.8 times longer than antennomeres 4 and 5 combined (15: 19), middle antennomeres slightly inflated, subapical antennomeres 5 to 8 weakly compressed (Fig. 18). Mesoscutellum roundly elevated, without carina and peak, as high as the top of mesonotum in lateral view; posttergum with acute middle carina; metascutellum with short middle carina; dorsal-posterior platform of mesepimeron as broad as the diameter of the middle ocellus; posterior corner of metepimeral appendage platform-like, without basin; the distance between cenchri 2 times breadth of a cenchrus; mesopleuron and metapleuron as shown in Fig. 19. Inner tibial spur of hind leg approximately 0.7 times length of hind tarsomere 1 (5: 7); hind tarsomere 1 slender, as long as following 4 tarsomeres combined; claw with inner tooth shorter than outer tooth. Ovipositor sheath slightly shorter than hind tarsomere 1 (13: 14), apical sheath slightly longer than basal sheath, apical margin roundish in lateral view (Fig. 20), setae on sheath slightly curved in dorsal view. Fore wing with crossvein cu-a joining cell 1M at basal



Figs 14–26. *Macrophya curvatitheca* Li, Liu & Heng, **sp. nov.** 14. Female, dorsal view. 15. Male, dorsal view. 16. Female head, dorsal view. 17. Female head, anterior view. 18. Female antenna. 19. Female mesopleuron and metapleuron. 20. Ovipositor sheath, lateral view. 21. Lancet. 22. 8th–10th serrulae of lancet. 23. Male head, anterior view. 24. Male antenna. 25. Gonoforceps. 26. Penis valve. Scale bars: 14–15 = 1 mm, 22 = 50 μm, 21, 25–26 = 100 μm.

1/3, crossvein 2r joining cell 2Rs at apical 1/5, cell 2Rs clearly shorter than cell 1Rs, anal cell with a short petiole, slightly shorter than crossvein 1r-m; petiole of anal cell in the hind wing about 2/3 times longer than crossvein cu-a. Lancet short and narrow, with 18 serrulae (Fig. 21), middle serrulae flat, middle serrulae each with 2 proximal and 15 to 18 distal teeth, subbasal teeth minute, annular spine bands narrow, 8th to 10th serrulae at basal as shown in Fig. 22.

Male. Body length 5.5–6.0 mm (Fig. 15); body color and structure similar to female, except for labrum not entirely white, center with black maculae; clypeus largely white, base black (Fig. 23); antennomere 2 as broad as long (Fig. 24); following parts white: anterior sides of fore femur and tibia, apical 1/2 of middle femur, apex largely on anterior side and a small macula on subapex on dorsal side of hind tibia; posterior margin of abdominal tergum 1 with a white band broader than female; subgenital plate longer than broad, apical margin roundish; inner side on base of harpe slightly protruding, weakly narrpwed toward apex (Fig. 25); penis valve as shown in Fig. 26, valviceps about 2 times as long as broad.

Holotype ♀, China, Ningxia, Mt. Liupan, Fengtai (35°23′ N, 106°20′ E; elev. 1 945 m), 24 June 2008, Fei Liu leg., desposited in CSCS. Paratypes: 1♂, same data as holotype; 1♂, China, Jilin, Baihe Town, Mt. Changbai, Tianchi (42°01′ N, 128°03′ E; elev. 2 640 m), 22 July 2012, CSCS12132, Ze-Jian Li and Meng-Meng Liu leg.; 1♂, China, Jilin, Baihe Town, Mt. Changbai, Changbai Waterfall (42°02′ N, 128°03′ E; elev. 1 850 m), CSCS12131, Ji-Gang Jiang and Lan-Lan Deng leg. all desposited in CSCS.

Distribution. China (Jilin, Ningxia).

Etymology. The new specific name "*curvatitheca*" is derivid from two Latin words, the "*curv*" (curve) and "*thec*" (theca), with reference to the setae on sheath curved in dorsal view.

Remarks. The new species is similar to *M. bui* Wei & Li, 2012, but differs from the latter by: postocellar area 2.5 times broader than long; a broad white band on posterior margin of pronotum; inner side of the metepimeron appendage without carina; fore and middle trochanters largely black, hind trochanter largely white; ovipositor sheath shorter than fore tibia; lancet short, middle serrulae with 15 to 18 distal teeth. In *M. bui*, postocellar area 1.7 times broader than long; pronotum entirely black; inner side of the metepimeron appendage with a distinct shiny and obtuse carina; all trochanters entirely black; ovipositor sheath as long as fore tibia; lancet slightly long, middle serrulae with 13 to 16 distal teeth.

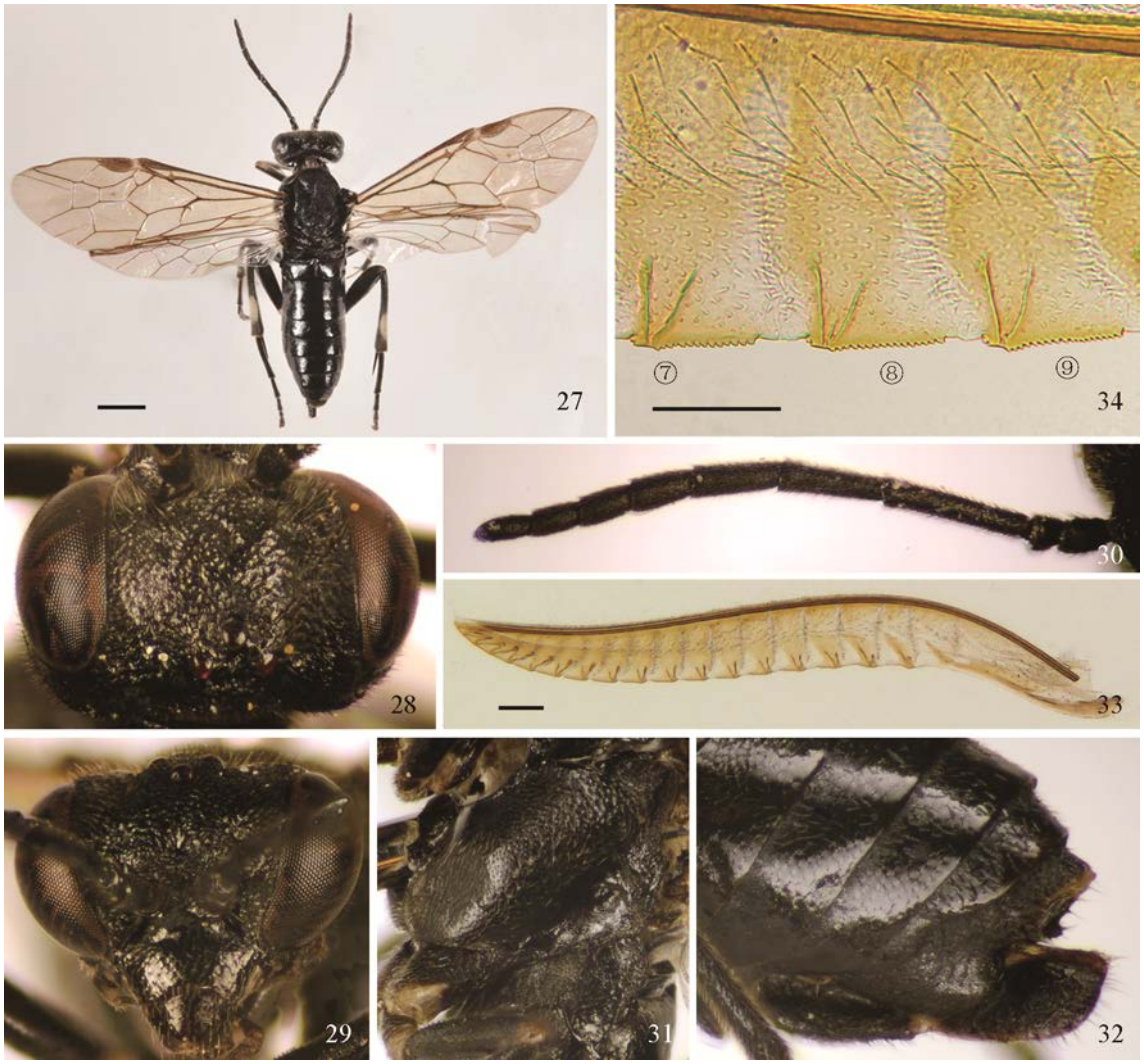
4.3 *Macrophya changbaina* Li, Liu & Heng, sp. nov. (Figs 27–34)

Female. Body length 6.5 mm. Body and legs black; palp sordid brown; following parts white: a narrow and short triangular anterior margin of the labrum pale brown; narrow bands on lateral sides of the pronotum, a narrow band on posterior margin of abdominal tergum 1, apical margin of abdominal tergum 10, apical margins of all coxae, basal margins and apical margins of fore and middle trochanters, hind trochanter except for ventral side with some black maculae, apex on anterior side of fore femur, a small macula on apical margin on anterior margin of middle femur, anterior side of fore tibia except for apex with some black maculae, a small macula on subapex on dorsal side of middle tibia, a long macula on subapical 1/3 on dorsal side of hind tibia. Body hairs silver, setae on sheath pale black brown. Wings hyaline, without smoky macula, stigma and veins largely black brown (Fig. 27).

Dorsal head less shiny, frons densely and minutely punctured, without smooth interspaces between punctures, microsculptures fine (Fig. 28); labrum and clypeus less shiny, with some large and shallow punctures, microsculptures fine. Mesonotum less shiny, punctures on mesonotum shallower and denser than punctures on head, interspaces between punctures with fine microsculpteres; mesoscutellum less shiny, vertex with dense and shallow punctures, microsculptures fine; posttergum with some large punctures, microsculptures distinct; metascutellum dull, with indistinct punctures, microsculptures fine but distinct. Mesepisternum less shiny, densely and minutely punctured, interspaces between punctures narrow and with fine microsculptures; anepimeron dull, with rugose wrinkles; anterior margin of katepimeron strongly shiny and smooth, without puncture and microsculpture, posterior area of katepimeron with some shallow and large punctures, microsculptures distinct; metepisternum dull, with minute and shallow punctures; metepimeron less shiny, dorsal side with dense punctures, microsculptures distinct; mesopleuron and metapleuron as shown in Fig. 31. Abdominal tergum 1 shiny, lateral sides with some shallow punctures, center with fine microsculptures; other abdominal terga less shiny, with some indistinct punctures and fine microsculptures. Hind coxa and outer side of hind femur with dense and shallow punctures, interspaces between punctures with fine microsculptures, less shiny. Surface of sheath coriaceous, with indistinct punctures and fine microsculptures.

Center of labrum elevated, anterior margin of labrum truncate; clypeus weakly elevated, broader than the distance between the lower corner of the eyes; lateral sides distinctly convergent forwards, anterior margin subtriangular, shallowly

incised to approximately 1/3 length of clypeus, lateral corners slightly short and acute (Fig. 29); malar space 0.5 times the diameter of the middle ocellus; frons flat, ocellus as high as the top of the eyes in lateral view; middle fovea shallow, long dot-like; lateral foveae slightly deep, short furrow like; interocellar furrow distinct, postocellar furrow indistinct; POL : OOL : OCL = 3: 7: 5; center of postocellar area clearly elevated, 2.2 times broader than long; lateral furrow deep and slightly broad, divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, 0.9 times longer than head and thorax together, 0.8 times longer than abdomen; antennomere 2, 1.2 times as long as breadth, antennomere 3, 1.5 times as long as antennomere 4 (3: 2), 0.8 times longer than antennomeres 4 and 5 combined (5: 6), middle antennomeres slightly inflated, subapical antennomeres 5 to 8 weakly compressed (Fig. 30). Mesoscutellum roundly elevated, without carina and peak, as high as the top of the mesonotum in lateral view; posttergum with acute middle carina; metascutellum with short middle carina; dorsal-posterior platform of mesepimeron as broad as the diameter of the middle ocellus; posterior corner of metepimeral appendage like a platform; the distance between cenchri 1.6 times the breadth of a cenchrus; mesopleuron and metapleuron as shown in Fig. 31. Inner tibial spur of hind leg approximately 0.6 times length of hind tarsomere 1 (17: 28); hind tarsomere 1 slender, as long as following 4 tarsomeres combined; claw with inner tooth shorter than outer tooth. Ovipositor sheath slightly longer than hind tarsomere 1 (8: 7), apical sheath as long as basal sheath, apical margin roundish in lateral view (Fig. 32). Fore wing with crossvein cu-a joining cell 1M at basal 1/3, crossvein 2r joining cell



Figs 27–34. *Macrophya changbaina* Li, Liu & Heng, **sp. nov.** 27. Female, dorsal view. 28. Female head, dorsal view. 29. Female head, anterior view. 30. Female antenna. 31. Female mesopleuron and metapleuron. 32. Ovipositor sheath, lateral view. 33. Lancet. 34. 7th–9th serrulae of lancet. Scale bars: 27 = 1 mm, 34 = 50 μm, 33 = 100 μm.

2Rs at apical 1/3, cell 2Rs shorter than cell 1Rs, anal cell with a short petiole, about 1/2 times shorter than crossvein 1r-m; petiole of anal cell in the hind wing about 2/3 times longer than crossvein cu-a. Lancet short and narrow, with 18 serrulae (Fig. 33), middle serrulae flat, middle serrulae each with 1 to 2 proximal and 14 to 15 distal teeth, subbasal teeth small, annular spine bands narrow, 7th to 9th serrulae at basal as shown in Fig. 34.

Male. Unknown.

Holotype ♀, China, Jilin, Mt. Changbai, Wenquan Waterfall (42º02′N, 128º03′E; elev. 1 866 m), 23 July 2008, Mei-Cai Wei leg., desposited in CSCS.

Distribution. China (Jilin).

Etymology. The new specific name is based on the locality of specimen collected in Mt. Changbai, Jilin Province, China.

Remarks. The new species is similar to *M. bui* Wei & Li, 2012, but differs from the latter by: dorsal frons with slightly minute punctures; postocellar area 2.2 times broader than long; lateral sides of pronotum with distinct white maculae, center black; fore and middle trochanters largely black, hind trochanter largely white; subapical 1/3 with a long white macula on dorsal side of hind tibia; ovipositor sheath clearly longer than fore tibia; middle serrulae of lancet with 14 to 15 distal teeth, subbasal teeth small. In *M. bui*, dorsal frons with slightly large punctures; postocellar area 1.7 times broader than long; pronotum entirely black, posterior margin without white band; all trochanters entirely black; subapical 2/5 with a long white macula on dorsal side of hind tibia; ovipositor sheath as long as fore tibia; middle serrulae of lancet with 13 to 16 distal teeth, subbasal teeth minute.

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